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EFFECT OF TEA CONSUMPTION ON BLOOD ANTIOXIDANTS STATUS

***V. Makwana, B.G. Patel and M. Jadav**
Department of Food Science and Nutrition, ASPEE College of Home Science, Sardarkrushinagar, Dantiwada Agricultural University, Sardarkrushinagar - 385 506
E-mail: in.vishakha@gmail.com (**Corresponding Author*)

Abstract: The effect of tea consumption on blood lipid profile & antioxidant status in humans was carried out at the department of Food Science & Nutrition, Aspee College of Home Science, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Dist. Banasdkantha, Gujarat. 34 selected subjects are residing at the Sardarkrushinagar. Subjects were divided into two group experimental group & control group. Experimental group consist of 22 subjects & control group with 12 subjects. Experimental group was tea drinkers, whose daily intake was more than 3 cups of tea per day whereas; the later group was non tea drinkers. Overnight fasting blood samples were collected and analyzed for Lipid peroxidation in tea drinkers and non tea drinkers. The reduction of blood lipid peroxidation concentration among tea drinkers was -11.1% than non tea drinkers.
Keywords:

INTRODUCTION

Tea, a drink brewed from the dried leaves of *Camellia sinensis*, is the most frequently consumed beverage in the world apart from water (Graham *et al*., 1992). The chemical composition of tea is complex: polyphenols, alkaloids (caffeine, theophylline & theobromine), amino acids, carbohydrates, protein, chlorophyll, volatile compounds, fluoride, minerals & trace elements. Among these, the polyphenols constitute the most interesting group of tea leaf components & exhibit potent antioxidant activity in vivo & vitro (Wu *et al.,* 2002). Antioxidant such as vitamin 'C', 'E' & 'A' range of other plant compounds such as the flavonoids are considered as a beneficial (Nijveldt *et al*., 2001). The major tea catechins are (-)-epigallocatechin gallate (EGCG), (-)-epigallocatechin (EGC), (-)-epicatechingallate (ECG), (-)-epicatechin (EC) (Ho *et al.,* 1992). Tea is also a rich source of A typical cup of tea contains around 140 mg total flavonoids of which 10 mg are catechins, 15 mg of theaflavins & the rest are mainly complex thearubigins (Lakenbrink *et al*., 2000). The flavonoids in which tea extracts are particularly rich are known to be scavengers or reactive oxygen species (ROS) & free radicals (Bors & Saran *et al.,* 1987). However, on the recommendation of the Food and Agricultural Organization (FAO) studies were initiated to evaluate the protective

effect of green tea & black tea both on human health in generation. Tea has been considered a medicine & a health beverage since ancient times, but recently it has received a great deal of attention because tea polyphenols are strong antioxidants. Oxidative stress has been shown to be involved in the pathogenesis of numerous diseases, including cancer (Feng *et al*., 2001, Embola *et al*., 2002). Tea is also a rich source of flavonoids that constitute 33 % by dry weight of tea. Flavonoids are large group of phenolic products of plant metabolism with a variety of phenolic structures that have unique biological properties. Flavonoids found in tea show 20 times more powerful antioxidant activity than vitamin C (Vinson *et al*., 1995 & Craig *et al.,* 1999).

MATERIALS & MATHODS

A study determining the effect of tea consumption on blood lipid profile and antioxidant status in humans was carried at the department of Food Science and Nutrition, Aspee College of Home Science, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, district: Banaskantha.

In the present study, enrolled subjects were residing at the Sardarkrushinagar Dantiwada (district: Banaskantha). Basic information, anthropometric measurements, medical history and their dietary pattern were obtained through questionnaire method. Required analytical tests were performed at the laboratory, Aspee College of Home Science, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar.

Total 34 male selected ages between 35 to 50 years, took part in the present study. The volunteers were divided into two groups. First group *i.e.* Tea drinkers (>3 cups per day) consist of 22 subjects and the second group *i.e.* Non tea drinkers of 12 subjects. Subjects were randomly allotted to either of group. All the volunteers were informed about the purpose and detailed procedure of the experiments. 12 to 14 hours fasting blood samples were collected in EDTA vial from each subject by vein puncture. Estimation of oxidative stress related biochemical parameter Lipid Peroxidation (LPO) in RBC. The blood samples were centrifuged at 2000 rpm for 15 min. Plasma and Buffy coat were removed. The resulting erythrocyte pellet was made thrice with 0.15 M NaCl. Dilution (33%) of the packed RBC was made in phosphate buffer saline (PBS; pH 7.4; Yagi *et.al.,* 1998). The washed erythrocytes pellets were suspended in PBS; pH 7.4: & kept at 4° C for further analysis. These 33% packed RBC was used for the estimation of lipid peroxidation. Membrane peroxidation damage in erythrocytes was determined in terms of malondialdehyde (MDA)

production by the method of Shafiq-U-Rehman (1984). Determination of plasma ascorbic acid by the 2,4- dinitrophenylhydrazine method (Roe & Kuether 1943).

Table 1: Characteristics of the subjects

Group	Treatment	Number of subjects
Experimental	Tea drinkers	22
Control	Non tea drinkers	12

Diet Instruction

One week dietary records of all the subjects were obtained prior to baseline measurements. All subjects were instructed to maintain usual dietary habits throughout the study and to complete one week dietary records, which were to be returned at baseline and during the experimental periods. The Following biochemical estimations were carried out by using diagnostic kit method (Accucare™ Enzymatic Colorimetric Test).

RESULTS & DISCUSSION

Blood Lipid Peroxidation (LPO)

The result for lipid peroxidation (LPO) presented in table 2 and discussed as under in different heads. Lipid peroxidation refers to the oxidative degradation of lipids. It is the process whereby free radicals "steal" electrons from the lipid in cell membranes, resulting in cell damage. This process proceeds by the free radicals chain reaction mechanism. It most often affects polyunsaturated fatty acids, because they contain multiple double bonds in between which lies methylene – CH_2 groups that possess especially reactive hydrogen. In addition, end products of lipid peroxidation may be mutagenic & carcinogenic. For instance, the end product malondialdehyde react with deoxygaunosine in DNA, forming DNA adducts to them primarily M_1G. Certain diagnostic tests are available for the quantification of the end products of lipid peroxidation, as specially malondialdehyde (MDA). The most commonly used test is called a TBARS Assay (Marnett *et al.,* 1999).The results of blood lipid peroxidation concentration among tea drinkers (8.37 µmol %) was non significantly reduced than non tea drinkers (9.52µmol %). The reduction of blood lipid peroxidation concentration among tea drinkers was -11.1% than non tea drinkers. The results of the study are in accordance with the finding reports by Tinahons *et.al.,* (2008), determined that the short to medium term effect of a green tea extract on vascular function & lipid peroxidation compared to placebo. The mean diameter of the brachial artery following the post compression hyperlipidemia phase rose significantly ($P<0.01$) after treatment with green tea extract.

Follow mediated brachial artery vasodilatation ranged from 5.68% for the placebo phase to 11.98% after the green tea extract (P≤0.01). The consumption of green tea extract was associated with significant 37.4% reduction in the concentration of oxidized LDL (TBARS) (P≤0.01). Consumption of green tea extract by women for 5 weeks produced modifications in vascular function & an important decrease in serum oxidizability.

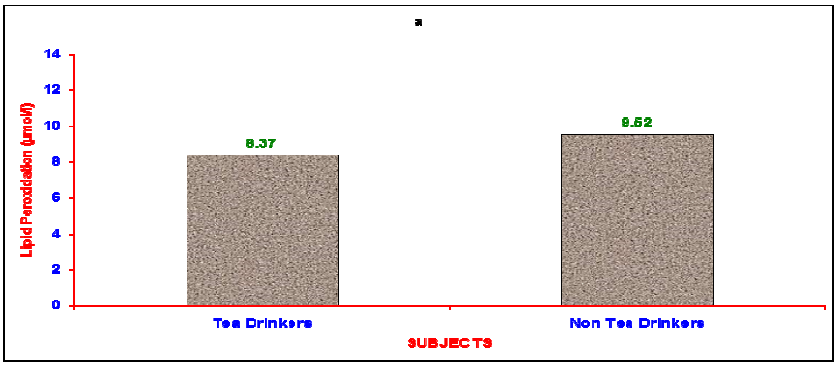
Table 2 Blood Peroxidation (LPO) level among tea drinkers and non-tea drinkers

Subjects	Numbers	Blood lipid peroxidation(µmol %)
Tea drinkers	22	8.37 ± 2.85
Non tea drinkers	12	9.52 ± 3.1

Values are mean ± S.D.

Non significant difference between tea drinkers and non tea drinkers at 5 per cent level (p ≤ 0.05)

Fig. 1: Antioxidants status among tea drinkers and non-tea drinkers



Serum Vitamin 'C'

Vitamin 'c' also known as ascorbic acid has a wide variety of uses in the body. Vitamin 'c' is present in the respiratory living fluid of human lungs and local deficits occur during oxidative stress. As an effective reducing agent and electron donor, vitamin 'c' has an essential role in numerous metabolic pathways most notably that of collagen synthesis. Vitamin 'c' is required for the post translational modification of pro collagen, poly peptides to form the resilient cross linked collagen molecule. Vitamin 'c' is needed for collagen synthesis, the protein that serves so many connective functions in the body. Among the body's collagen-containing materials and structures are the framework of bone, gums and binding materials in skin muscle or scar tissue. Production of certain hormones and of neurotransmitters and the metabolism of some amino acids and vitamins require vitamin 'c.' this vitamin also helps the liver in the detoxification of toxic substances in the system and the blood in fighting infections. Ascorbic acid is important in the proper function of the immune system. as an

antioxidant, it react compound like histamines and peroxides to reduce inflammatory symptoms. Its antioxidant property is associated with the reduction of cancer incidences.

As an antioxidant vitamin 'c' performs primary role to neutralize the free radicals. Vitamin 'c' is water soluble it can work both inside and outside of the cells to combat free radicals damage. Vitamin 'c' protects the DNA of the cells from the damage caused by free radicals and mutagens. It prevents harmful genetic alterations within cells and protects lymphocytes from mutation to the chromosomes. Vitamin 'c' prevents free radicals damage in the lungs and may ever help to protect the central nervous system from such damage.

Vitamin 'c' has been shown to have both antioxidant and pro-oxidant effects. The normal range of vitamin 'c' in human blood is 0.4 to 1.5 mg/dl. This parameter is studied in the present study. The results of vitamin 'c' levels among tea drinkers or non tea drinkers are depicted in table 3 and graphically depicted in fig. 2.

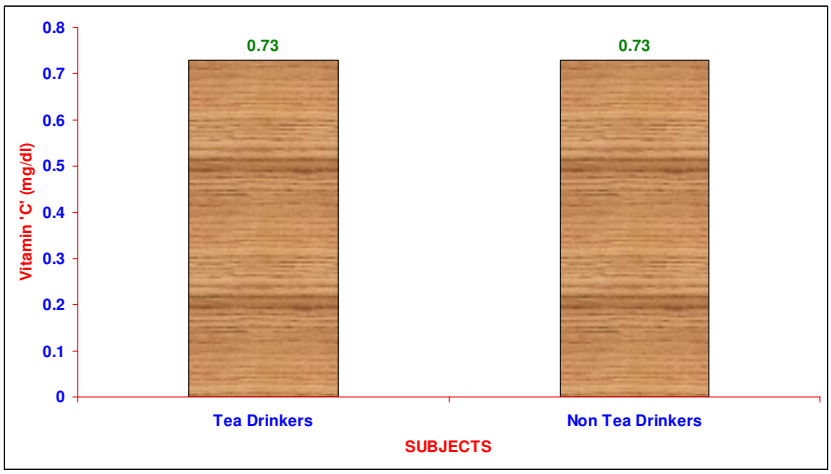
Table 3: Plasma vitamin 'C' level among tea drinkers and non-tea drinkers.

Subjects	Numbers	Plasma Vitamin 'C' (mg%)
Tea drinkers	22	0.73 ± 0.22
Non tea drinkers	12	0.73 ± 0.22

Values are mean ± S.D.

Significant difference between tea drinkers and non-tea drinkers at 5 per cent level ($p \leq 0.05$).

Fig. 2: Vitamin C status among tea drinkers and non-tea drinkers



The value of vitamin 'c' level among tea drinkers (0.73 mg %) was equal to the non tea drinkers (0.73 mg %). Hence, it can be concluded that both group have an equal concentration of plasma vitamin 'c.' there was no noticeable difference observed of vitamin 'c' level between tea drinkers and non-tea drinkers.

The results of the study are in accordance with the findings reported by syuzou *et al.* (2008) studied that the catechins in green tea have been shown to reduce a risk of coronary. Five healthy female subjects consumed ground green tea (1.5 g/3 times/day) for two weeks after a washout period of one week, when they drank water instead of tea. After two weeks tea drinking the subjects drank water again. They measured the lag time of conjugated denies formation of plasma and ldl to oxidation by $cuso_4$. the lag time of conjugated denies formation are increased in all subjects after ground green tea consumption from 67 ± 19 to 118 ± 42 min in plasma and from 47 ± 6 to 66 ± 10 min in ldl. The cholesterol contents in plasma and ldl decreased 10 mg/dl after ground green tea consumption. The β-carotene, α-tocopherol, vitamin 'c' and uric acid contents in plasma did not change after ground green tea consumption.

Summary & Conclusion

In conclusion, the present findings clearly demonstrated that the tea consumption more than 3 cups of tea per day had potential to reduce blood lipid peroxidation (LPO) level. There was no any significant difference in vitamin 'C' level between both groups under this study.

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